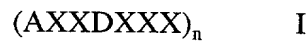


We claim:

1. A synthetic peptide of the formula I:



wherein

- 5 A is Ile, Leu, Val or a derivative thereof;
 D is Leu, Ile, Val or a derivative thereof;
 each X is an amino acid residue or derivative thereof which
 corresponds to an amino acid residue of an epitope of a native
 coiled-coil protein;
10 the X residues in each (AXXDXXX) repeat form a set of X residues; and
 n is equal to or greater than 1.
- 15 2. The peptide of Claim 1 wherein A is Ile and D is Leu in every
 (AXXDXXX) repeat.
3. The peptide of Claim 1 wherein n is about 3 to 6.
4. The peptide of Claim 1 wherein said X residues are amino acids that are
 solvent exposed in an coiled-coil region of the native protein.
- 20 5. The peptide of Claim 1 wherein each of said sets of X residues is from the
 same epitope of a single protein.
6. The peptide of Claim 1 which contains at least two different sets of X
25 residues.

7. The peptide of Claim 6 wherein each of said different sets is independently selected from the group consisting of different epitopes of the same protein and epitopes from different proteins.
- 5 8. The peptide of Claim 1 which further comprises additional amino acids at the C-terminus and/or N-terminus of the peptide.
9. The peptide of Claim 8 wherein said additional amino acid residues are CNleG at the N-terminus of the peptide.
- 10 10. The peptide of Claim 1 wherein the set of X residues correspond to a consensus sequence of solvent exposed residues of native coiled-coil proteins.
- 15 11. The peptide of Claim 10 wherein the coiled-coil proteins are selected from the group consisting of Pneumococcal surface protein A, Pneumococcal surface protein C, and Pneumococcal adhesin A.
- 20 12. The peptide of Claim 11 wherein the peptide comprises an amino acid sequence selected from the group consisting of
EELX₁X₂KIDELDX₃EIAX₄LEKX₅ (SEQ ID NO:5) and
EELX₁X₂KIDELD (1-11 of SEQ ID NO:5), wherein X₁, X₂, X₃, X₄ or X₅
is any amino acid.
- 25 13. The peptide of Claim 12 wherein
X₁ is S, Q, N or D;
X₂ is D, N or K;

X₃ is A or N;

X₄ is K, E or D; and

X₅ is N, D or E.

- 5 14. A synthetic peptide of the formula I:



wherein

A is Ile, Leu, Val or a derivative thereof;

D is Leu, Ile, Val or a derivative thereof;

- 10 each X is an amino acid residue or derivative thereof which
corresponds to an amino acid residue of an epitope of a native
coiled-coil protein, except at least one X is replaced with a charged
amino acid residue in a manner which allows a salt bridge to form
between the charged amino acid and another amino acid residue of
15 an opposite charge, which salt bridge facilitates the peptide to
assume a coiled-coil structure;

the X residues in each (AXXDXXX) repeat form a set of X residues; and
n is equal to or greater than 1.

- 20 15. A peptide of Claim 14 wherein the charged amino acid is selected from the
group consisting of Asp, Glu, Lys, Arg and His.

16. A method of making a peptide of the formula I comprising:
a) selecting an epitope of a coiled-coil protein;
25 b) determining which amino acid residues of said epitope are solvent
exposed; and

- c) inserting said solvent exposed amino acid residues into the X positions of formula I.
- 5 17. The method of Claim 16 wherein the coiled-coil protein is a microbial protein.
18. The method of Claim 16 wherein the selection of epitopes is performed using a computer algorithm.
- 10 19. The method of Claim 16 wherein more than one set of epitopic amino acids is used.
- 15 20. The method of Claim 19 wherein each of said sets is independently selected from the group consisting of different epitopes of the same protein and epitopes from different proteins.
21. A composition useful to stimulate an immune response in an animal, said composition comprising at least one peptide of formula I.
- 20 22. The composition of Claim 21 wherein the peptide of formula I is conjugated to a carrier protein.
23. The composition of Claim 21 further comprising an adjuvant.
- 25 24. The composition of Claim 21 which contains at least two different sets of X residues.

25. The composition of Claim 24 wherein each of said different sets is independently selected from the group consisting of different epitopes of the same protein and epitopes from different proteins.
- 5 26. The composition of Claim 24 which is useful to stimulate an immune response to more than one strain and/or species of microorganism.
27. A method of eliciting an immune response in an animal, comprising administering a peptide of the formula I to said animal.
- 10 28. An antibody which recognizes a peptide of the formula I.
29. The antibody of Claim 28 wherein the peptide of the formula I contains solvent exposed amino acids from a microbial protein.
- 15 30. The antibody of Claim 28 which binds to more than one strain and/or species of microorganism.
31. The antibody of Claim 28 which is polyclonal or monoclonal.
- 20 32. A pharmaceutical composition comprising an antibody according to Claim 28.
- 25 33. The composition of Claim 32 which further comprises a pharmaceutically acceptable excipient or carrier.

34. An antibody produced by administering a peptide of the formula I to an animal so as to stimulate an immune response.
- 5 35. A composition useful as a vaccine, wherein said composition comprises a peptide of formula I.
36. The composition of Claim 35 wherein more than one set of epitopic amino acids is used in the peptide of formula I.
- 10 37. The composition of Claim 36 wherein the sets of epitopic amino acids are from different strains and/or species of microorganism.
38. The composition of Claim 35 which provides cross protection to more than one strain and/or species of microorganism.
- 15 39. The composition of Claim 36 which provides cross protection to more than one strain and/or species of microorganism.
40. The composition of Claim 37 which provides cross protection to more than one strain and/or species of microorganism.
- 20 41. The composition of Claim 35 which further comprises a pharmaceutically acceptable excipient or carrier.
- 25 42. A method of preventing a microbial infection comprising administering to a mammal susceptible to said infection a peptide of formula I.

43. The method of Claim 42 wherein more than one set of epitopic amino acids is used in the peptide of formula I and the sets of epitopic amino acids are from different strains and/or species of microorganism.
- 5 44. The method of Claim 42 which is useful to prevent infection by several strains and/or species of microorganism.
45. The method of Claim 43 which is useful to prevent infection by several strains and/or species of microorganism.
- 10 46. A method of treating or preventing microbial infection in an animal susceptible to or suffering from such infection, comprising administering to said animal an effective amount of an antibody to a microbial protein, wherein said antibody is produced by administering a peptide of formula I to an animal.
- 15 47. The method of Claim 46 which prevents symptoms of infection in said animal.
- 20 48. The method of Claim 46 which is useful to treat or prevent infection by several strains and/or species of microorganism.
49. A method of determining the presence of a particular microorganism in a sample comprising:
- 25 a) contacting the sample with an antibody to a peptide of formula I which peptide comprises epitopes from the particular microorganism; and

b) determining whether said antibody binds to a component of said sample.

50. The method of Claim 49 wherein the sample is a biological sample.

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51. The method of Claim 49 which is used to determine the causative agent of a microbial infection.

52. The method of Claim 51 which is used to simultaneously detect the presence of several strains and/or species of microorganism in the sample.

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53. The method of Claim 50 which is used to simultaneously detect the presence of several strains and/or species of microorganism in the sample.

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54. The method of Claim 51 which is used to simultaneously detect the presence of several strains and/or species of microorganism in the sample.

55. A method for determining the presence of antibodies to a microbial protein in a biological sample, comprising:

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- a) contacting said biological sample with a peptide of formula I, which peptide comprises at least one epitope from said microbial protein; and
- b) determining whether antibodies in said biological sample bind to said peptide.

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56. The method of Claim 55 which is used to determine prior exposure of an animal to a particular microorganism.

57. The protein of Claim 8 wherein the additional amino acids stabilize the peptide through the formation of lactam bridges.

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